# SHRI VENKATESHWARA UNIVERSITY


# Syllabus

## B.TECH

## Mechanical Engineering

## VI$^{th}$ SEMESTER

**(Four Years Degree Programme)**

**(w.e.f. 2019-20)**

## SCHOOL OF ENGINEERING & TECHNOLOGY

# Mechanical Engineering

SEMESTER-VI

| Sl. No. | Subject Codes | Subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CT | TA | Total | PS | TE | PE | | |
| 1 | SME-601 | Manufacturing Technology | 4 | 0 | 0 | 20 | 10 | 30 | | 70 | | 100 | 4 |
| 2 | SME-602 | Design of Machine Elements | 3 | 1 | 0 | 20 | 10 | 30 | | 70 | | 100 | 4 |
| 3 | SME-603 | Internal Combustion Engines | 3 | 0 | 0 | 20 | 10 | 30 | | 70 | | 100 | 3 |
| 4 | SME-604 | Computer Aided Design | 3 | 1 | 0 | 20 | 10 | 30 | | 70 | | 100 | 4 |
| 5 | SOE-061 | Sociology, Society and Culture | 3 | 0 | 0 | 20 | 10 | 30 | | 70 | | 100 | 3 |
| 6 | SME-611 | Mechanical Engineering Lab (Design) II | 0 | 0 | 4 | | | | 25 | | 25 | 50 | 2 |
| 7 | SME-612 | Project-II | 0 | 0 | 4 | | | | 50 | | 50 | 100 | 2 |
| | | Total | | | | | | | | | | 650 | 22 |

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|---|---|
| Course Code | **SME-601** |
| Course Title | **Manufacturing Technology** |
| Number of Credits | **4 (3L:1T:0P)** |

**Objectives:**
(i)To provide knowledge onmachines and related tools for manufacturing various components.
(ii) To understand the relationship between process and system in manufacturing domain.
(iii) To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.

**Course Contents:**
Tooling for conventional and non-conventional machining processes: Mould and die design, Press tools, Cutting tools; Holding tools: Jigs and fixtures, principles, applications and design; press tools – configuration, design of die and punch; principles of forging die design. **(12)**

Metrology: Dimensions, forms and surface measurements, Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; Metrology in tool wear and part quality including surface integrity, alignment and testing methods; tolerance analysis in manufacturing and assembly. Process metrology for emerging machining processes such as microscale machining, Inspection and workpiece quality. **(16)**

Assembly practices: Manufacturing and assembly, process planning, selective assembly, Material handling and devices. **(6)**

Linear programming, objective function and constraints, graphical method, Simplex and duplex algorithms, transportation assignment, Traveling Salesman problem; Network models: shortest route, minimal spanning tree, maximum flow model- Project networks: CPM and PERT, critical path scheduling; Production planning& control: Forecasting models, aggregate production planning, materials requirement planning. Inventory Models: Economic Order Quantity, quantity discount models, stochastic inventory models, practical inventory control models, JIT. Simple queuing theory models.**(16)**

**Course Outcomes:**
Upon completion of this course, students will be able to the tooling needed for manufacturing, the dimensional accuracy and tolerances of products, assembly of different components and the application of optimization methods in manufacturing.

**Text Books:**
(i) Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.
(ii) Taha H. A., Operations Research, 6th Edition, Prentice Hall of India, 2003.
(iii) Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern, 1994.

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|---|---|
| Course Code | **SME-602** |
| Course Title | **Design of Machine Elements** |
| Number of Credits | **4 (3L:1T:0P)** |

**Objectives:**

This course seeks to provide an introduction to the design of machine elements commonly encountered in mechanical engineering practice, through

1. A strong background in mechanics of materials based failure criteria underpinning the safety-critical design of machine components
2. An understanding of the origins, nature and applicability of empirical design principles, based on safety considerations
3. An overview of codes, standards and design guidelines for different elements
4. An appreciation of parameter optimization and design iteration
5. An appreciation of the relationships between component level design and overall machine system design and performance

**Course Contents:**

Design considerations - limits, fits and standardization, Review of failure theories for static and dynamic loading (including fatigue failure), Design of shafts under static and fatigue loadings, Analysis and design of sliding and rolling contact bearings, Design of transmission elements: spur, helical, bevel and worm gears; belt and chain drives, Design of springs: helical compression, tension, torsional and leaf springs, Design of joints: threaded fasteners, pre-loaded bolts and welded joints, Analysis and applications of power screws and couplings, Analysis of clutches and brakes

**Course Outcomes:**

Upon completion of this course, students will get an overview of the design methodologies employed for the design of various machine components.

**Text Books:**

[1] Shigley, J.E. and Mischke, C.R., Mechanical Engineering Design, Fifth Edition, McGraw-Hill International; 1989.
[2] Deutschman, D., Michels, W.J. and Wilson, C.E., Machine Design Theory and Practice, Macmillan, 1992.
[3] Juvinal, R.C., Fundamentals of Machine Component Design, John Wiley, 1994.
[4] Spottes, M.F., Design of Machine elements, Prentice-Hall India, 1994.
[5] R. L. Norton, Mechanical Design – An Integrated Approach, Prentice Hall, 1998

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|---|---|
| Course Code | **SME-603** |
| Course Title | **Internal Combustion Engines** |
| Number of Credits | **3 (3L:0T:0P)** |

**Objectives:**
1. To familiarize with the terminology associated with IC engines.
2. To understand the basics of IC engines.
3. To understand combustion, and various parameters and variables affecting it in various types of IC engines.
4. To learn about various systems used in IC engines and the type of IC engine required for various applications

**Course Contents:** Review of ideal cycles; Details of fuel-air cycles. Combustion in SI and CI engines, Combustion stages, Combustion chambers and Abnormal combustion. Fuel supply systems in SI and CI engines, carburettors, Port fuel injection, Direct injection and Common rail injection.
Ignition system, Lubrication system and Cooling system. Testing of IC engines. Engine emissions and control. Advanced IC Engine concepts.

**Course Outcomes:**
Students who have done this course will have a good idea of the basics of IC engines and how different parameters influence the operational characteristics of IC Engines

**Text Books:**
1. Obert E. F, "Internal Combustion Engines and Air Pollution", Harper and Row Publication Inc.
NY, 1973.
2. Heisler H, "Advanced Engine Technology", Edward Arnold, 1995.
3. Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY, 1989
4. Heldt P. M, "High Speed Combustion Engines", Oxford & IBH publishing Co. India, 1985.
5. Stockel M W, Stockel T S and Johanson C, "Auto Fundamentals", The Goodheart, Wilcox Co. Inc., Illinois, 1996.

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| Course Code | **SME-604** |
| Course Title | **Computer Aided Design** |
| Number of Credits | **4 (3L:1T:0P)** |

**Objectives:**
To provide an overview of how computers can be utilized in mechanical component design

**Contents:**
Fundamentals of Computer Graphics- Product cycle, sequential and concurrent engineering, Computer Aided Design, CAD system architecture, computer graphics, Coordinate systems, 2D and 3D transformations, viewing transformation

Geometric Modeling- representation of curves, Hermite curves, Bezier curves, B-spline curves, rational curves, Techniques of surface modelling, surface patch, Coons and bicubic patches, Bezier and B-spline surfaces, Solid modelling techniques, CSG and B-rep.

Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, computer Animation

Assembly of parts- assembly modelling, interferences of positions and orientation, tolerance analysis, mass property calculations, mechanism simulation and interefence checking
CAD standards- Graphical Kernel System (GKS), standards for vexchange images, Open Graphics Library (OpenGL), Data exchange standards- IGES, STEP, CALS etc., Communication standards

**Course Outcomes:**
Upon completion of this course, the students can use computer and CAD software for modelling mechanical components

**Text Books:**
1. Ibrahim Zeid, Mastering CAD CAM, Tata McGraw Hill Publishing Co. 2007.
2. C. McMohan and J. Browne, CAD/CAM Principles, II edition, Pearson Education, 1999.

3. W. M. Neumann and R.F. Sproul, Principles of Computer Gra[hics, McGraw Hill, 1989.
4. D. Hearn and M.P> Baker, Computer Graphics, Prentice Hall Inc., 1992.

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| Course Code | **SOE-061** |
| Course Title | **Sociology, Society and Culture** |
| Number of Credits | **3 (3L:0T:0P)** |

**Course Objectives:**
To enable potential managers to understand the influence of the wider societal context on the operations within their organizations. Central to this endeavor is the treatment of work as a sociological phenomenon.

**Course Content**

Industrial Sociology: Nature and Scope of Industrial Sociology-Development of Industrial Sociology.

Rise and Development of Industry : Early Industrialism – Types of Productive Systems– The Manorial or Feudal system – The guild system – The domestic or putting-outsystem – and the factory system – Characteristics of the factory system – causes andConsequences of industrialization

Industrialization in India. Industrial Poling Resolutions – 1956

Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: courses, strikes & lockouts, Industrial Relations Machinery Bi-partite& Tri-partite Agreement, Labour courts & Industrial Tribunals, Code of Discipline,Standing order.

**Course Outcome:** Syllabus enable to the students to understand the fundamental about discipline and management

**Text Books:**

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.

| Course Code | **SME-611** |
|---|---|
| Course Title | **Mechanical Engineering Lab (Design) II** |
| Number of Credits | **2 (0L:0T:4P)** |

**Objectives:**
(i) To understand the measurement of mechanical properties of materials
(ii) To understand the deformation behaviour of materials
(iii) To understand the kinematic and dynamic characteristics of mechanical devices

**Contents**
1. Uniaxial tension test on mild steel rod
2. Torsion test on mild steel rod
3. Impact test on a metallic specimen
4. Brinnell and Rockwell hardness tests on metallic specimen
5. Bending deflection test on beams
6. Strain measurement using Rosette strain gauge
7. Microscopic examination of heat-treated and untreated metallic samples
8. Velocity ratios of simple, compound, epicyclic and differential gear trains
9. Kinematics of four bar, slider crank, crank rocker, double crank, double rocker and oscillating cylinder mechanisms
10. Cam & follower and motion studies
11. Single degree of freedom Spring-mass-damper system, determination of natural frequency and damping coefficient
12. Determination of torsional natural frequency of single and double rotor systems- undamped and damped natural frequencies

**Course Outcomes:**
Students who have undergone the course will be able to understand the measurement of mechanical properties of materials and will be able to characterize the dynamic behavior of mechanical systems

| Course Code | **SME-612** |
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| Course Title | **Project- II** |
| Number of Credits | **2 (0L:0T:4P)** |

**Objectives:**
This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the college. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.